The Neural Nexus

AI-Powered Vehicle Number Plate Classification

TEAM: ML DEV

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Problem Statement: Inefficient Vehicle Identification

Manual Processes

Manual identification is slow, costly, and prone to errors.

Inconsistent Formats

Varied plate formats and image conditions reduce system reliability.

Cost Impact

Manual verification costs major cities about $500,000 annually.

Proposed Solution: RTO-VISION 3.0

Robust ML Model — 1

Automates classification of RTO codes from vehicle plates.

2 — Image Preprocessing

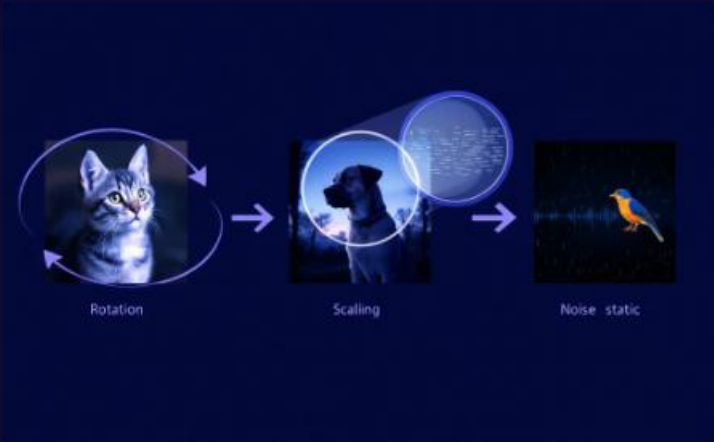Handles lighting, angle, and clarity to improve accuracy.

High Accuracy — 3

Targets over 93.43% accuracy across diverse image conditions.

Dataset Acquisition and Preprocessing

Dataset Size

More than 50,000 images labeled with RTO codes.

Augmentation Techniques

- Rotation
- Scaling
- Noise Injection

Image Preparation

Noise reduction, contrast adjustment, and perspective correction applied.

Data split: 80% training, 20% validation.

Model Development: Architecture & Training

1 — **CNN Feature Extraction**

Powerful convolutional neural networks extract meaningful visual patterns.

2 — **Transfer Learning**

Utilizes pretrained models such as ResNet and VGG for accelerated training.

3 — **Optimization Techniques**

- Adam optimizer
- Categorical cross-entropy loss
- Early stopping to prevent overfitting

4 — **Training Setup**

Executed over 100 epochs on an NVIDIA Tesla V100 GPU for optimal results.

Tech Stack

Python 3.8

TensorFlow & Keras

ML frameworks for building and training models.

Javascript

Frontend

Server

Backend

Evaluation and Results

Accuracy

Achieved 93.43% accuracy on validation dataset.

Robustness

Performs well despite noise and distortions and smaller datasets.

Comparisons

Outperforms baseline OCR and rule-based methods significantly.

Conclusion and Future Directions

✓ **Project Success**

Developed a highly accurate RTO code classification model.

✓ **Applications**

Useful in parking systems, traffic monitoring, and security.

✓ **Next Steps**

Expand dataset, enhance robustness, and deploy real-time solutions.

✓ **Integration**

Plan to link with vehicle registration databases for added functionality.

About RTO-VISION 3.0

-Accurately identifies vehicle registration regions through number plate analysis.

-Enhances tracking, enforcement, and parking management.

-Leveraged AI and machine learning to automate and improve vehicle identification systems.